

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

PTG 0116 – TRIGONOMETRY AND COORDINATE GEOMETRY

(All sections / Groups)

2 MARCH 2017
9:00 a.m – 11:00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 3 pages with 4 questions and an appendix.
2. Answer all questions.
3. Unless stated otherwise, if an answer is given as a decimal, it should be rounded to **four** significant figures.
4. Write your answers in the Answer Booklet provided.
5. Show all workings.

Question 1

- (a) If $\cos \theta = -0.8244$ and $\csc \theta < 0$, find θ in radians for $0 \leq \theta \leq 2\pi$. [4 marks]
- (b) Verify the identity $\frac{\sin \theta}{\csc \theta - \cot \theta} = 1 + \cos \theta$. [4 marks]
- (c) Solve the trigonometric equation $\cos \frac{\theta}{2} = 1 + \cos \theta$ for $0 \leq \theta \leq 2\pi$. [8 marks]
- (d) Calculate the shaded area of overlapping circles shown in Figure 1. Both circles are with radius of 2.7 m. Distance between the centres PQ is 4.2 m. [9 marks]
- Note: Area of a sector of a circle with radius r is $\frac{1}{2}r^2\theta$, where θ is in radian.

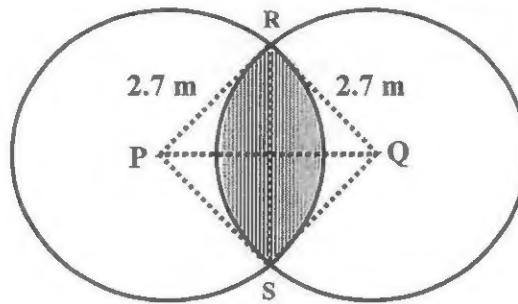


Figure 1

Question 2

- (a) Perform the following. Leave the answer in rectangular form.
- (i) $\frac{(6\angle 130^\circ)(2\angle 45^\circ)}{1+i\sqrt{3}}$ [3 marks]
- (ii) $[2.78(\cos 56.8^\circ + i \sin 56.8^\circ)] + [1.37(\cos 207.3^\circ + i \sin 207.3^\circ)]$ [3 marks]
- (b) (i) Evaluate $-\sqrt{-49} - i^{15}$. [4 marks]
- (ii) Find the cube roots of the answer obtained in (b)(i). Leave the answer in rectangular form. [7 marks]
- (c) Given $\mathbf{p} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$ and $\mathbf{q} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$.
- (i) Find $(2\mathbf{p} + \mathbf{q}) \times (\mathbf{p} - 2\mathbf{q})$. [4 marks]
- (ii) Determine the angle θ between \mathbf{p} and \mathbf{q} for $0 \leq \theta \leq \pi$. [4 marks]

Question 3

- (a) Determine the value of k for the following:
- (i) The midpoint of the line segment from $(-4, k)$ to $(6, 1)$ is $(1, 5)$. [2 marks]
- (ii) The distance between the points $(11, k)$ and $(-1, 3)$ is 13. [3 marks]
- (iii) The points $(6, -1)$, $(3, k)$ and $(-3, -7)$ are on the same line. [4 marks]
- (b) Find the equation of the ellipse with foci at $(1, 3)$ and $(9, 3)$ and length of major axis equals 10. [7 marks]
- (c) Identify the type of curve represented by the following equations. Find the centre (or vertex if it is a parabola). Sketch each curve.
- (i) $\frac{(x+4)^2}{4} + \frac{(y-1)^2}{1} = 1$ [5 marks]
- (ii) $(x+3)^2 = -12(y-1)$ [4 marks]

Continued...

Question 4

(a) Given $A = \begin{bmatrix} 0 & 3 & -1 \\ 1 & 2 & -4 \end{bmatrix}$, $B = \begin{bmatrix} -4 & 1 & 0 \\ -2 & 3 & -2 \end{bmatrix}$, $C = \begin{bmatrix} 4 & -1 \\ 1 & 0 \\ 2 & 1 \end{bmatrix}$ and $D = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 0 \\ 0 & -3 & 1 \end{bmatrix}$,

solve the following:

- (i) $3A - 2B$ [3 marks]
 - (ii) $5C^T$ [2 marks]
 - (iii) $CA + 3I_3$ [4 marks]
 - (iv) D^{-1} [10 marks]
- (b) Find y in the following linear system using Cramer's rule.
- $$\begin{aligned} 3x + 3y + z &= 9 \\ x + 2y + z &= 8 \\ 2x - y + z &= 1 \end{aligned}$$
- [6 marks]

APPENDIX

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$\sin^2 A = \frac{1 - \cos 2A}{2}$$

$$\cos^2 A = \frac{1 + \cos 2A}{2}$$

$$\tan^2 A = \frac{1 - \cos 2A}{1 + \cos 2A}$$

$$\begin{aligned} \tan A &= \frac{\sin 2A}{1 + \cos 2A} \\ &= \frac{1 - \cos 2A}{\sin 2A} \end{aligned}$$

$$\sin A \cos B = \frac{1}{2} [\sin(A-B) + \sin(A+B)]$$

$$\cos A \cos B = \frac{1}{2} [\cos(A-B) + \cos(A+B)]$$

$$\sin A \sin B = \frac{1}{2} [\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$